

June 3, 1969

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CONTAINER AND LID

3,447,714

Filed Dec. 22, 1967

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FIG. I

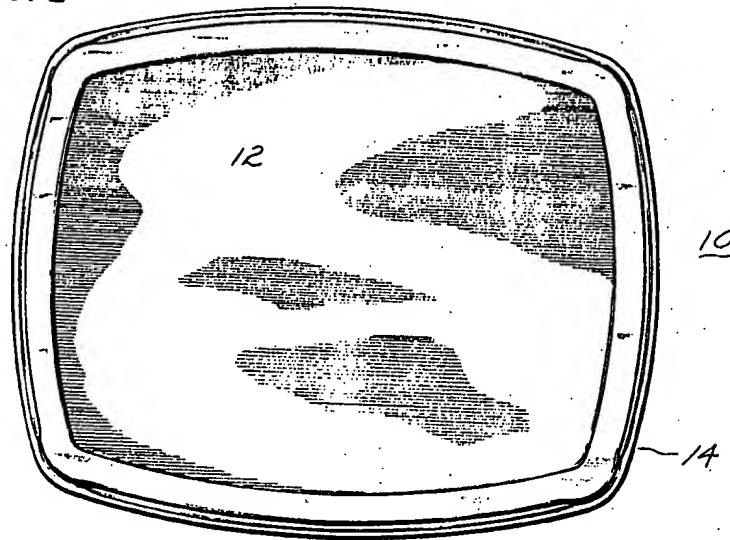
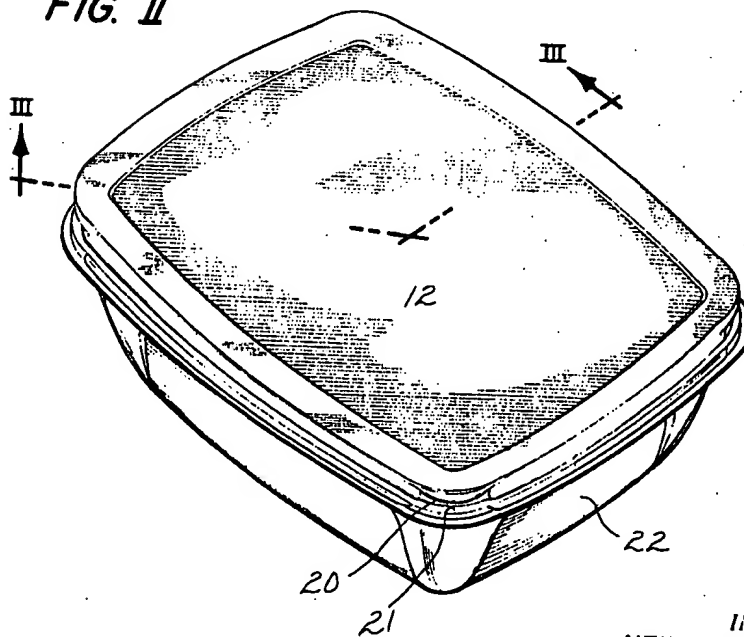


FIG. II



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FIG. III

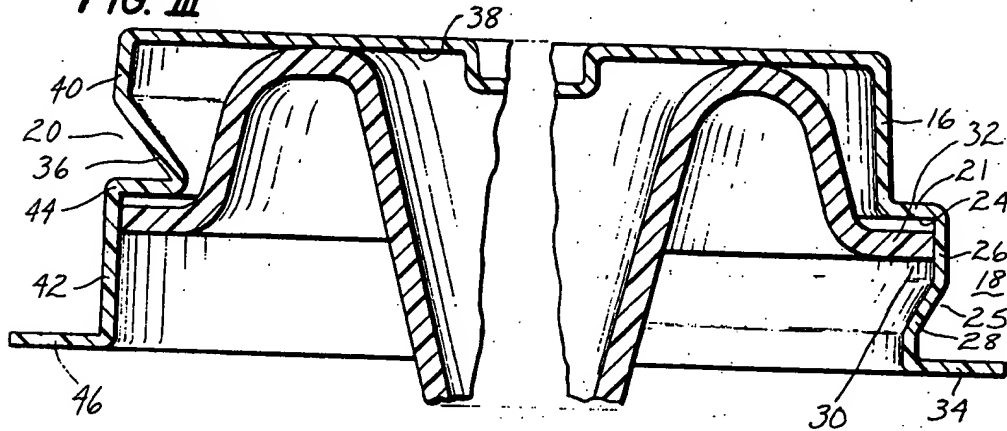


FIG. IV

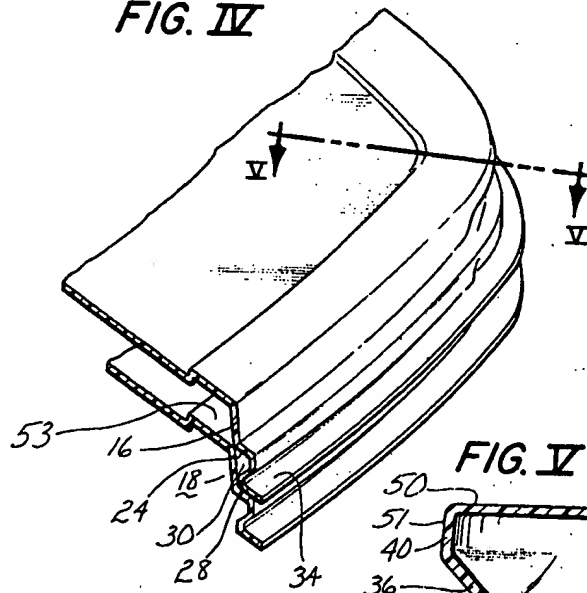


FIG. V

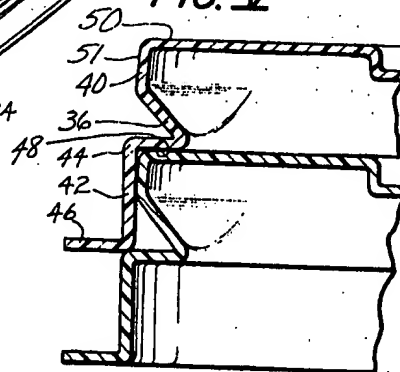
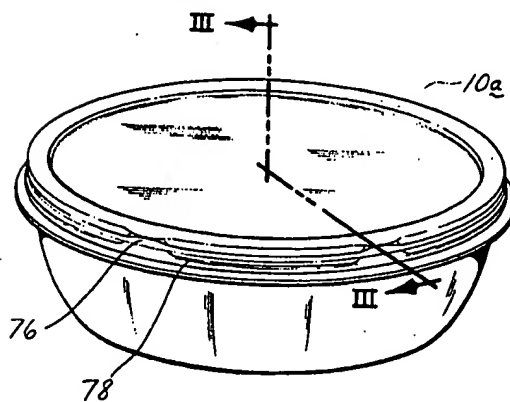


FIG. VI



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## ABSTRACT OF THE DISCLOSURE

A stackable, snap-on, tight sealing, easily removable, resealable, plastic lid for a container body, having spaced peripheral stacking means and sealing means intermediate the stacking means. The lid is particularly adaptable for noncircular configurations where the stacking means are in the lid corners.

This application relates to a container, and more particularly to a stackable, plastic container lid.

Thermoplastic containers are becoming increasingly useful in packaging and storage applications of all types. These containers are usually closed with snap-on lids made of relatively thin plastic, in order to minimize material costs and to facilitate a rapid production rate of the lids. The lids functionally must seal tightly, yet be easily removable by a consumer, and resealable on the container body in cases where only portions of the contents are used on each opening of the container. The cost and production objectives have been achieved, and lids have even been manufactured which adequately serve their required function regarding the manner in which they close the container. However, it has been found that difficulties arise in processing such lids on high speed automated packaging equipment. More specifically, these lids are not adapted to be individually and successfully fed from a sacked formation, as required in automatic dispensing of lids from a nested stack in a magazine, operating in conjunction with a capping machine. This deficiency has proven a great handicap in the practical usefulness of such container lids, and is basically due to the fact that the thin wall lids are so flexible that they warp and wedge either into or over each other during handling and feeding operations. When this occurs segments of the rim portions of adjacently nested lids become interlocked, thereby preventing successive, smooth feeding of the lowermost stacked lid.

Attempts have been made to provide a lid of the type mentioned above which overcomes the jamming problem by forming continuous, inwardly extending peripheral walls which act as shelves for supporting an adjacently stacked lid. These reversely angled peripheral shelves create molding problems since they tend to interfere with discharge of the lid from its mold cavity, thereby resulting in reduced production rates and at times distortion of the lid. These latter problems are less acute with lids made of a relatively soft thermoplastic such as polyethylene, since this material has a tendency to shrink away from its conforming projections in the mold after forming, and is also highly flexible, so that a relatively deep radial stacking shelf may be formed, without resulting in lid distortion or interference to any great extent with mold ejection. However, with relatively rigid thermoplastics having high moduli of stiffness, such as styrene based materials, mold shrinkage is insignificant, and flexibility is at a minimum. Consequently a lid made from one of these materials having a reversely tapered peripheral shelf extending sufficiently inwardly to prevent telescoping usually cannot be removed from its mold cavity.

When the lids are circular, the curved configuration of the sides where the stacking shelves are located tends

to resist the outward flexing which causes the troublesome wedging or telescoping. With non-circular configurations, however, this resistance is non-existent, because of the absence of any substantial curvature, and therefore the side of a generally rectangular lid, for example, will readily flex outwardly with even the slightest top loading to cause wedging together of lids in a nested stack. Stackability, therefore, has been limited at most in the past to circular lids made from relatively soft thermoplastics.

The problem presented is not only to provide tight sealing, easily removable, resealable lids made from any type of thin plastic, regardless of lid shape, which are free of objectionable jamming problems when nested together, but also to accomplish this in an economical manner so as not to counteract the low cost of producing lids from thin plastic sheet.

It has now been found that this dilemma of difficulties which has only been compromised in the past has been effectively solved by the present invention. There is provided a stackable, snap-on, tight sealing, readily removable, resealable plastic lid having nesting shelves which can be readily produced at high production rates with little or no distortion during discharge from the mold cavity, regardless of the type of lid configuration or of the type of material of fabrication used.

Accordingly, it is an object of the present invention to provide an improved stackable container lid which avoids the many prior art difficulties discussed above.

It is another object of this invention to provide a stackable container lid adaptable for automated packaging operations.

It is a further object of this invention to provide a stackable container lid adaptable for use with automated packaging equipment, which can be produced at high production rates with a minimum of difficulty incurred in its ejection from the forming mold.

It is another object of this invention to provide a stackable container lid adaptable for use with automated packaging equipment, which is provided with means to minimize contact between adjacent sides of lids in stacked formation.

It is another object of this invention to provide a tightly sealed, easily opened container having a lid with the above mentioned features.

A further object of this invention is to provide a non-circular, snap-on container lid which is readily separable from a stacked position.

An additional object of this invention is to provide a stackable, snap-on container lid of relatively rigid plastic material.

These and other objects will in part be obvious and will in part appear hereinafter.

These and other objects are accomplished by providing a one-piece, plastic, stackable container lid comprising a top wall, and an integral peripheral skirt having formed therein, means for effecting attachment of the lid to a container body, and stacking means peripherally spaced from the attachment means. The stacking means preferably are reversely tapered projections located in the corners when the lid is of a noncircular configuration. The lid is preferably made of plastic having a flexural modulus in excess of about 100,000 p.s.i.

In describing the overall invention, reference will be made to preferred embodiments illustrated in the accompanying drawings in which:

FIG. I is a top plan view of a lid embodying the invention;

FIG. II is a perspective view of the lid of FIG. I in closure sealing engagement on a container body;

FIG. III is an enlarged, partial, sectional, elevational view along the line III—III of FIGS. II and VI;

FIG. IV is a sectional, perspective view of a nested stack of the lids of FIG. 1;

FIG. V is a sectional, elevational view along the line V—V of FIG. IV;

FIG. VI is a perspective view similar to FIG. II illustrating a circular lid in closure sealing engagement with a round container body.

With reference to the drawings, wherein identical numerals refer to identical parts, there is shown in FIGS. I and II, a generally rectangular, thin wall, plastic, one-piece, resilient, stackable, non-circular lid, generally indicated as 10, for a container body generally indicated as 22. Lid 10 may also have a circular configuration as depicted at 10a in FIG. IV. Lid 10 comprises elongated, generally flat, top wall 12, and integral, depending, peripheral skirt portion or flange 14, downwardly disposed with respect to top wall 12.

Peripheral skirt 14 generally tapers outwardly from top wall 12, and comprises slightly outwardly disposed, substantially vertical, spacer wall 16 (FIG. III) depending from the outer edge of top wall 12, and attachment means 18 located below and integrally joined to wall 16. Attachment means 18 function to fasten or lock lid 10 on container body 22 as depicted in FIG. II and the portion on the right side of FIG. III. Attachment means or locking means 18 formed in skirt 14 are peripherally spaced intermediate and axially below or adjacent the ends of stacking means 20, which are also formed in skirt 14, and located in FIGS. I—III only in the four corners of elongated lid 10. Attachment means 18 include intermediate lip 21 extending outwardly from the lower end of spacer wall 16, and having abutment surface 24 on its underside. Lip 21 projects outwardly when considered with respect to the inward projection of stacking shoulder 36 of the stacking means 20, as apparent from FIG. III. Retaining wall 25 of attachment means 18 extends downwardly at 26 from the outer end of lip 21, and inwardly at reversely angled portion 28, so as to define cavity 30 within which lip or projection 32 of peripheral sealing means in the top portion of container body 22 resiliently and lockingly snaps, to seal the opening in the body of the container. Lift tab or projection 34 may be included in attachment means 18 and projects outwardly from the lower end of reversely angled portion 28.

Stacking means 20 of integral peripheral skirt 14 are located in the four corners of elongated lid 10, and comprise a plurality of reversely tapered stacking shoulders or extensions 36, one for each corner (FIG. III), which are axially adjacent the inner surface 38 of top wall 12, and separated therefrom by leg 40 which tapers slightly outwardly from the corner peripheral edges of lid 10. As can be seen from FIG. III, shoulders or shelves 36 are inwardly offset from the outer periphery of top wall 12. Substantially vertical extension 42 projects downwardly from the outer end 44 of each stacking shoulder 36, and is connected at its lower end to corner lift tab 46 which extends outwardly from the lower end of extension 42.

As depicted in FIGS. II and III, attachment means 18 are non-existent in the corners below the stacking shoulders 36, being there replaced by vertical extension 42, so that lip 32 of container body 22 is axially free of any retaining projections on lid skirt 14 beneath it in these areas. Attachment or projection receiving means 18 are, however, located beneath projection 32 in the remainder of the periphery of the container other than in the corners. In other words vertical extension 42 may be considered as a spacer means peripherally intermediate the attachment or locking means, whereat body 22 is free of sealing engagement with lid 10.

To remove lid 10 from body 22, the bottom face of corner lift tab 46 is gently pushed upwardly by the thumb or finger of a consumer in either of the four corners of the container, while another finger radially spaced in-

wardly presses down on the top surface of the top wall 12 of the lid, so as to initially pry lid 10 away from lip 32 of body 22 in the particular corner area chosen to be open. With this manner of corner opening, resistance to removal is nonexistent because of the absence in the corners of any locking or attachment means. After the lid has been pried away from the lip in the corner area, it may then be easily grasped by the fingers and peripherally peeled off of the remainder of the upper portion of the body, the upward tension exerted on the resilient plastic lid tending to force outwardly, the retaining wall 25 of attachment means 18 of skirt 14, so that attachment means 18 are frictionally forced beyond lip 32 of container body 22. To direct and induce the consumer to initiate easy opening of the container in the corner area, a simple notation referring to corner opening may be provided by a label or by direct printing on the upper surface of top wall 12 of lid 10. There is thus provided a lid which tightly seals around a substantial portion of the top of a container body, yet is easily opened by commencing removal of the lid in a corner area where there is no sealing.

Obviously, if it is desired to reapply lid 10 to body 22 to reseal the container in situations where the contents is not completely used after one opening, lid 10 may be initially placed across the open mouth of the container body, and then peripherally pressed downwardly, with the result that lip 32 of container body 22 will bend slightly downwardly and inwardly to permit retaining wall 25 of the attachment means to slide over and around the outside edge of lip 32, thereby permitting lip 32 to resiliently snap into place against abutment surface 24 of intermediate lip 21.

Lids 10 are stacked as illustrated in FIGS. IV and V. Bottom surface 48 (FIG. V) of stacking shoulder 36, located in each of the four corners of the lids, rests against and overlies the outer marginal edge 50 of top wall 12 of a similarly constructed lid situated below it in the stack formation, while leg 42 of the upper lid abuts against the outside surface 51 of leg 40 of the lower lid. As is evident from the sectioned portion of FIG. IV, in the extensive intermediate areas of the lid periphery between the lid corners, no effective stacking occurs since there are no stacking means present, there being no overlie in these areas of the bottom surface 24 of the upper lid, and the marginal edge 53 of the top wall intermediate the corners in the lower lid. In other words, stacking dependency is eliminated along the troublesome elongated substantially straight sides of the flexible skirt portion of the non-circular lid, and is limited to the less flexible corner areas having small radii of curvature, thereby eliminating the effect on stacking of outward flexing of the elongated sides of the skirt, i.e. telescoping and jamming when dispensing lids 10 from a magazine in an automated packaging line.

As depicted in FIG. VI spaced supporting projections 76 and attachment means 78 may be provided in a circular container body and lid, and are not necessarily confined to non-circular shapes.

The above description and particularly the drawings are set forth for purposes of illustration only and are not to be taken in a limited sense.

Stackability as used herein means the capacity of a lid to resist telescoping or wedging, i.e. an upper lid being forced down past the stacking shoulder of a lower lid when the stack is loaded from above, or dropped, for example, from heights of from about 4 to 6 feet.

It has been found that container lids of relatively stiff rigid materials having peripherally continuous stacking shoulders extending inwardly with respect to the general outward flare of the lid sides, could not be removed from the forming mold when the shoulder extended radially inward from the lid side by more than 0.010 inch. On the other hand, when the shoulder radial extent was reduced below 0.010 inch, significant telescoping occurred when

stacks of such lids were subjected to any significant top loading pressure. Such stacks containing telescoped lids are generally unsuitable for use with normal, automated packaging equipment used in industry.

With respect to the present lids, it was further found that the shoulders making up the stacking means could extend radially in from the sidewall or skirt of the lid by up to 0.050 inch, and still be readily ejected from the forming mold, even when the material was relatively stiff and inflexible. Stackability improved as the radial extent of the peripherally interrupted shoulders increased from 0.010 inch up to about 0.050 inch with results generally poor below 0.010 inch.

Positioning of the stacking shoulders around the lid periphery may be according to any pattern desired. As stated, however, a particular problem occurs with non-circular lid shapes, where, due to the configuration, the lid sides radially flex outwardly around the periphery, but at the same time are put under tension and even tend to flex slightly inwardly in the corner areas when pressure is exerted from above. This inherent characteristic of non-circular shapes is used to advantage in a preferred embodiment of the present invention, in that the stacking shoulders are positioned in the area of the periphery where outward flexing is non-existent or at a minimum, i.e. in the corner areas. The peripheral extent of the stacking shoulders may be varied widely with about  $\frac{1}{8}$  to about  $\frac{3}{4}$  inch being preferred.

Though use of interrupted lid stacking means is uniquely applicable to non-circular type lids in the present invention, it should be understood that it may be used with circular lids, with ease of mold discharge being the primary consideration in such cases. Possible configurations include square, oval, oblong, triangular and the like.

The attachment means for locking the lid to the mouth of the container body may be any of a number of different types of configurations other than the projecting container lid and confining lid cavity depicted in the preferred embodiments. For example, instead of the flush sealing type lid shown in the drawings, which fits across the mouth and attaches to the container body outside its rim, a plug type lid may be employed which projects partially into the body and has a peripheral rim which snaps into a mating groove in the container body. Instead of a projecting lip in the upper end of the container body, a rounded beaded rim which fits into a groove in the lid or vice versa may be utilized.

Tight engagement of the lid with the body around a substantial portion, but not completely around the container periphery has been found to provide the desired balance between satisfactory protection of the container contents, and ease of opening by the consumer, by providing for initial lid separation in those limited areas where the lid is not attached to the container body. It has generally been found that engagement of the lid with the body around at least 80% of the periphery is required to provide this desired balance between protection of the container contents, and ease of opening.

The lids of the present invention may be injection molded, or may be formed from thermoplastic sheet material by causing a portion of the sheet to be drawn or forced into a female mold cavity against its inner walls. In this manner, the sheet material will conform to the inner configuration of the mold cavity. After contact with the mold walls, the plastic lid is cooled somewhat and then ejected from the mold cavity. The difficulty or ease of lid ejection will depend to a large extent on the means used to eject the lid, the type of plastic utilized, the tendency of the plastic to stick to the inner walls of the mold cavity and the negative angles or inward projections within the female mold cavity. One of the novel aspects of the present invention is reduction of the gripping action caused by the projections or protuberances in the mold cavity used to form the shoulders of the lid stacking means, while at the same time maintaining the release

efficiency of the lids when in nested relationship prior to application to a container body. It is found that the projections or protuberances required in the mold or cavity to produce the stacking means in the present lid offer substantially reduced resistance to withdrawal or stripping of the lid from the mold. It is felt that this is due to the reduced shelf area and the capability of the lid to flex laterally around the novel stacking means projections during extraction.

The material from which the lid is formed may be any plastic capable of being molded in accordance with the previously mentioned design parameters. Thermoplastics generally have the advantages of being tough, difficult to break under ordinary circumstances, and have sufficient strength to be fabricated relatively thinly from web stock for economy purposes, since the containers contemplated herein are of the throw away type which are meant to be non-reusable after consumption of the initial contents of the container. The resulting lid, when thermoformed in this manner is unitary in construction, has no seams, and is of the thin wall variety having a generally uniform thickness between about 2 to 80 mils.

Useable thermoplastics are polymers based on styrene, vinyl halide, vinyl acetate, cellulose acetate or butyrate, ethyl cellulose, acrylic acid esters, metacrylic acid esters, acrylonitrile, isobutylene, fluoroolefins and chlorofluoroolefins, polyolefins such as for example polyethylene, or isotactic polypropylene, polyacrylates, polymethacrylates, polycarbonates, polyvinyl chloride, polyethylene terephthalates, as well as copolymers, interpolymers, graft polymers, and chlorinated and chlorosulfonated polymers of the monomers corresponding to the above mentioned polymeric products, and mixtures of the same.

Particularly useful materials for forming these lids are relatively stiff thermoplastics having a flexural modulus in excess of about 100,000 p.s.i., and preferably between 250,000-500,000 p.s.i., such as, for example, rubber modified polystyrene or polystyrene which preferably has incorporated a rubber compound grafted or mechanically blended therein, e.g. acrylonitrile, butadiene, styrene copolymers. These relatively stiff materials give excellent reproducibility in thermoformed parts. Close tolerances may be maintained and parts may be molded from these materials in more accurate detail than with softer materials, resulting in accurate fits between close fitting portions of the lid and container body. These materials are also well adapted to thermoforming processes, i.e. not subject to any great extent to variations in operating conditions. They are tough and resilient even when thin and kept at low temperatures, and are usually inert to most foods which may be packaged in the container. Unfortunately, however, these thermoplastics are relatively stiff and have very little tendency to shrink away from undercut portions of the forming mold on cooling, in comparison to the shrinkage obtained with softer materials. It has therefore been particularly difficult to mold stacking shelves of these materials having sufficient radial extent to resist telescoping, yet which may be ejected from the mold without difficulty. The interrupted stacking of the present invention provides equivalent capabilities in this area for lids of thermoplastic materials having a flexural modulus in excess of about 100,000 p.s.i., with those of softer materials, and is therefore particularly adaptable to use with these materials.

In general, the present lid finds particular utility in automated and semi-automated packaging lines for foods and other consumer items, and wherever storage space dictates that a plurality of lids in telescoping relation must be stored. The assembled container comprising the lid and container body is tightly sealed, yet easily openable and resealable. The lids have improved structural stability, and may be easily dispensed with little or no difficulty from the bottom of a stack, while at the same time presenting fewer manufacturing difficulties in the molding operation, particularly with respect to withdrawal

of the lid from the mold. Consequently, high manufacturing rates may be maintained at very low costs.

What is claimed is:

1. A plastic, stackable container lid comprising:

- (A) a top wall; and
- (B) a skirt integrally attached to the periphery of the top wall, having formed therein:

- (a) stacking means including a shoulder adapted to seat on the top wall of a similarly constructed adjacently stacked lid;

- (b) means for effecting attachment to a container body peripherally spaced between and independent of the stacking means.

2. The lid of claim 1 wherein the attachment means are situated below the stacking means.

3. The lid of claim 1 wherein the stacking means is a shelf inwardly offset from the periphery of the top wall.

4. The lid of claim 1 wherein the attachment means includes a cavity below the stacking means, having an inwardly extending lower retaining wall.

5. The lid of claim 1 wherein the plastic has a flexural modulus in excess of about 100,000 p.s.i.

6. The lid of claim 1 wherein the lid configuration is non-circular.

7. A one piece, resilient, plastic, stackable container lid comprising:

- (A) an elongated top wall; and

- (B) a skirt portion, downwardly disposed with respect to the top wall including:

- (a) a plurality of reversely tapered extensions longitudinally adjacent the corners of the elongated top wall;

- (b) means below and adjacent the ends of the tapered extensions for receiving a projection of an associated container.

8. The lid of claim 7 wherein the projection receiving means are disposed beneath the edges of the top wall other than in the corners.

9. The lid of claim 7 wherein the plastic is a styrene based polymer.

10. A one piece, resilient, plastic, stackable container lid comprising:

- (A) a generally flat top wall; and

- (B) a flange tapering outwardly from the periphery of the top wall and having formed therein:

- (a) a plurality of reversely tapered stacking shoulders adjacent the underside of the top wall;

- (b) means below and peripherally intermediate

the stacking shoulders, for effecting attachment of the lid to a container including:

- (I) an intermediate abutment surface projecting outwardly in relation to the lower ends of the stacking shoulders;

- (II) a retaining wall extending downwardly and inwardly from the outer end of the abutment surface; said retaining wall and abutment surface defining a cavity for an engaging container lip.

11. The lid of claim 10 wherein the depending flange includes a substantially vertical spacer wall above the attachment means.

12. The lid of claim 10 wherein the depending flange includes a substantially vertical extension downwardly extending from the stacking shoulder.

13. The lid of claim 10 including an outwardly extending lifting projection beneath the attachment means.

14. A container comprising:

- (A) a body having at the top portion thereof

- (a) peripherally extending sealing means;

- (B) a lid for the body having:

- (a) a top wall;

- (b) an integral peripherally extending skirt having formed therein:

- (1) stacking means including a shoulder adapted to seat on the top wall of a similarly constructed adjacently stacked lid; and

- (2) locking means peripherally spaced between and independent of the stacking means for effecting peripherally spaced engagement with the sealing means of the body.

15. The container of claim 14 wherein the lid has a generally circular contour.

16. The container of claim 14 wherein the lid is plastic and has a flexural modulus within the range of between about 250,000-500,000 p.s.i.

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U.S. Cl. X.R.

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